Photon
Systems
Instruments

PSI (Photon Systems Instruments) spol. s r.o.

Drasov 470, 664 24 Drasov, Czech Republic
E-mail: info@psi.cz

www.psi.cz

Photon
Systems
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Professional Instruments
for Plant Science, Biotechnology
and Agriculture

PlantScreen™
Systems

www.psi.cz

PlantScreen™
Phenotyping Systems

are designed for automated high-throughput monitoring and quantification of plant architecture, yield and performance at high precision in controlled environments, the greenhouse and the field. The PlantScreen™ platform can be configured for single pots, multiple pots or trays, providing flexibility of use with various species ranging from Arabidopsis to mature crop plants.

PlantScreen™ Systems are designed as modular multi-sensor solutions for plant screening in low-to-high-throughput configurations that can be customized for numerous plant morphologies and structures at various stages of development.

PSI PlantScreen™ Phenotyping Systems are designed for monitoring numerous aspects of plant growth, development and response to biotic and abiotic stresses.

They can be configured to meet the user's specific requirements with respect to the size and number of plants screened, as well as the environmental conditions to which they are exposed.
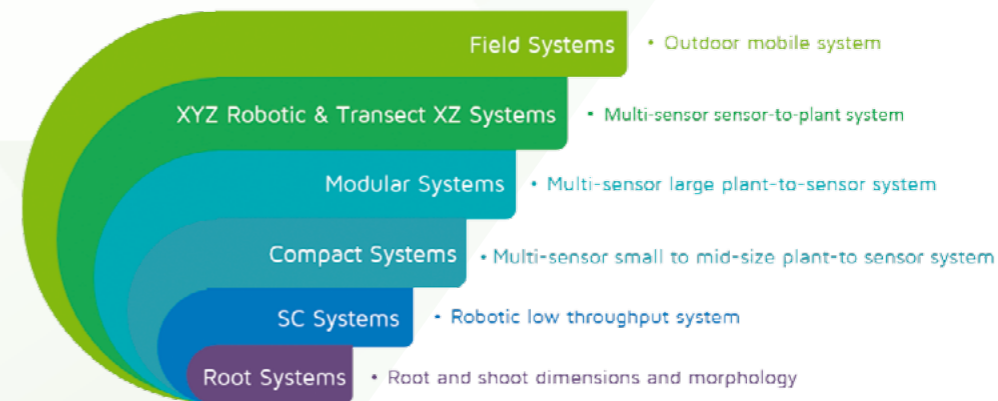
PlantScreens™ incorporate numerous instruments for imaging plant morphometric and physiological parameters, with some including an acclimatization chamber that may be used to equilibrate plants under controlled conditions, or for plant cultivation.
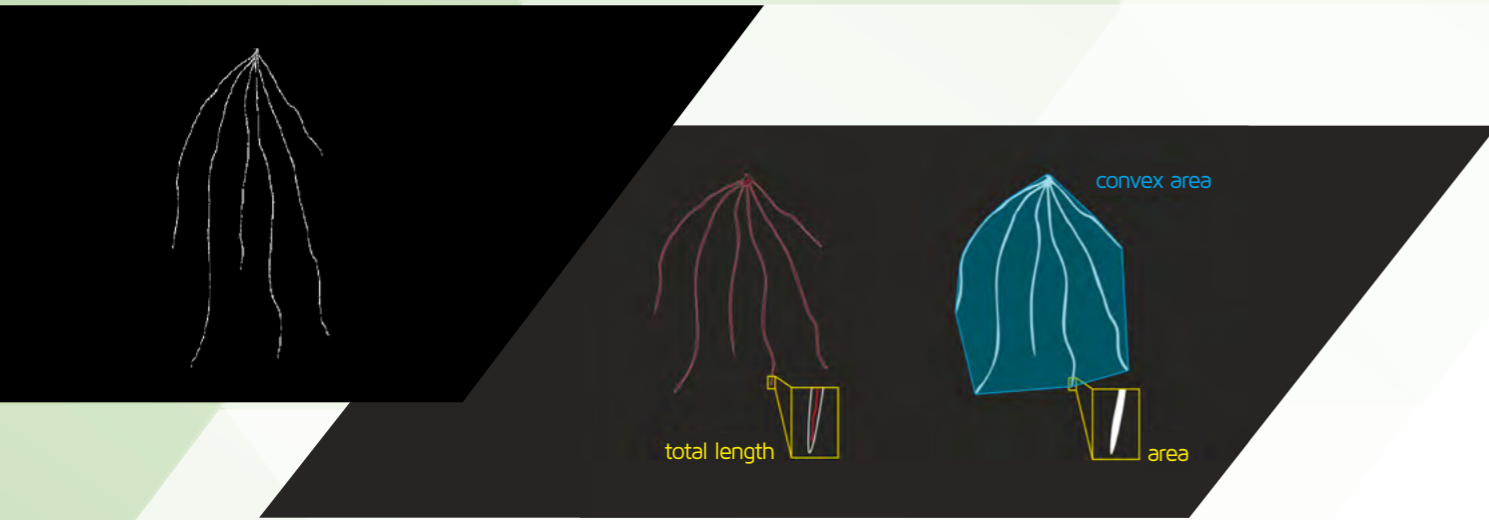
Applications

- Abiotic and biotic stress responses
- Morphology and growth assessment
- Nutrient management
- Photosynthetic performance
- Trait identification
- Biostimulant screening
- Ecotoxicology
- Pathogen interaction

The following versions of PlantScreen™ Systems are available:

- **Field Systems** • Outdoor mobile system
- **XYZ Robotic & Transect XZ Systems** • Multi-sensor sensor-to-plant system
- **Modular Systems** • Multi-sensor large plant-to-sensor system
- **Compact Systems** • Multi-sensor small to mid-size plant-to sensor system
- **SC Systems** • Robotic low throughput system
- **Root Systems** • Root and shoot dimensions and morphology

PlantScreen™
Root Systems

convex area

total length

area

The PlantScreen™ Root System

is designed for non-invasive root screening of plants from early seedling emergence to later phases of plant development. The modular system consists of a number of rhizotrons that can be automatically moved from a cultivation area into an image acquisition unit.

Rhizotrons provide a natural soil environment suitable for long term cultivation and screening of fully developed root systems. Roots are imaged with a high-resolution monochromatic camera through the transparent side of the rhizotron box.

High resolution images allow visualization and morphometric analysis of the entire visible root system, providing various parameters of root dimensions and morphology.

Morphological and physiological characteristics of the shoots can be monitored in parallel.

Key features

- Plant-to-sensor concept
- High-resolution root imaging
- Parallel shoot imaging
- Modular angle positioning
- Multiple imaging sensors
- LED light/dark adaptation chamber
- Precise irrigation and nutrient delivery systems
- Integrated environmental sensors
- Comprehensive software package control
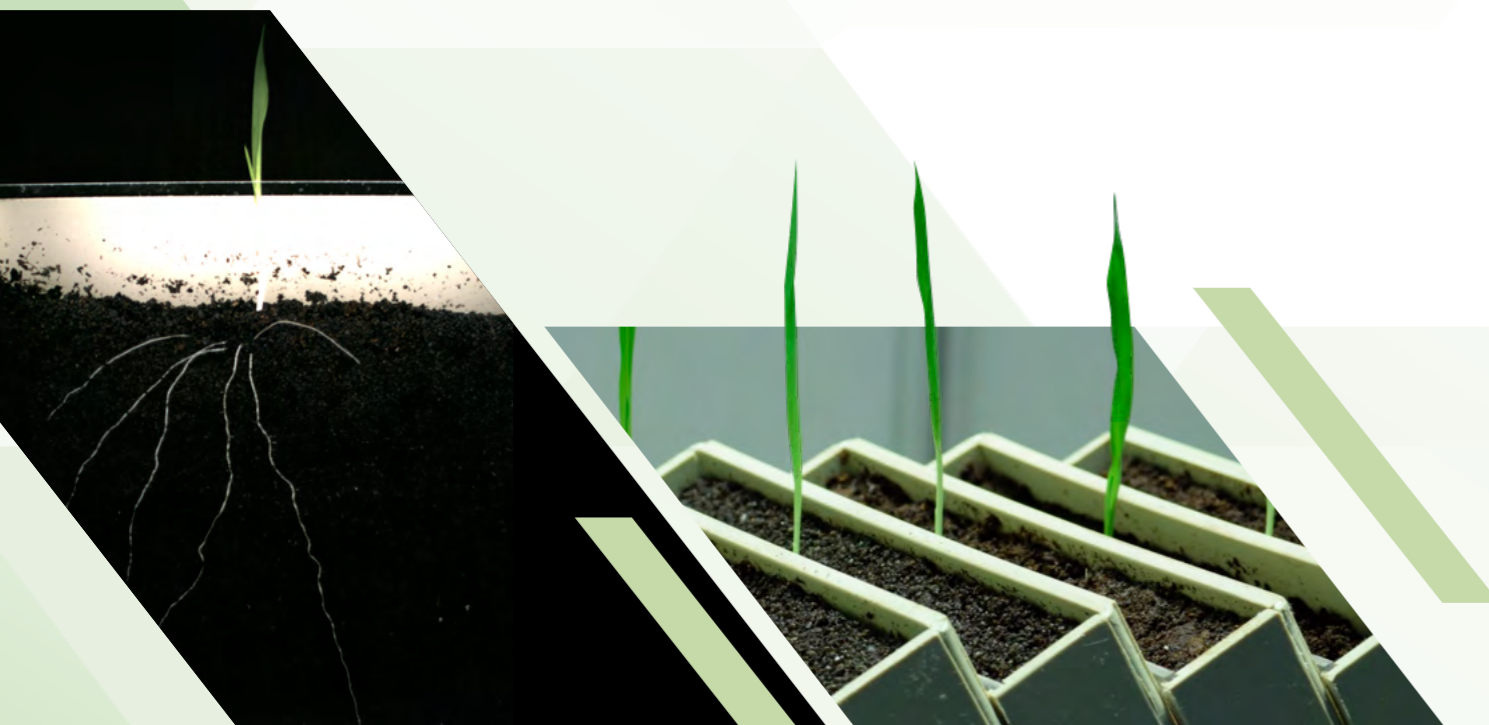
PlantScreen™
SC Systems

PlantScreen™ SC Systems

are complete stand-alone self-contained (SC) robotic solutions for automated high-precision phenotyping of small and mid-size scale plants (e.g. Arabidopsis, tobacco seedlings and crop plants).

The compact design is for low-throughput applications with manual sample loading. The platform incorporates various modules for digital analysis of plant growth dynamics and physiological performance, as well as dedicated illumination sources for light adaptation of plants prior and/or during the analysis and for short-term cultivation under defined conditions.

SC systems may be deployed in controlled environment rooms or in the greenhouse and are configurable and easy-to-move if relocation of the unit is necessary.

Key features

- Bench top compact design
- Durable and easy-to-move design
- Manual sample loading
- Configurable imaging sensors
- LED light/dark adaptation box
- Integrated environmental sensors optional
- Comprehensive software package

PlantScreen™
Compact Systems

The PlantScreen™ Compact System

is a conveyor-based integrated robotic solution designed for digital phenotyping and cultivation of small and mid-sized plants up to 40 cm in height (Arabidopsis, strawberries, turfgrass, soybean seedlings, tobacco, corn plants, etc.).

Plants are transported in trays that can be adapted to carry different numbers and configurations of plants grown in individual pots or in vitro (e.g. in multi-well plates), thus providing flexibility to screen different numbers and types of samples.

Numerous species may be studied, or a single species may be studied throughout its growth cycle. Multi-sensor digital data are usually acquired from top and side views.

Key features

- Plant-to-sensor concept
- Suitable for phenotyping of small up to mid-size scale plants
- Multiple imaging sensors
- LED light/dark adaptation chamber
- Flexible transportation tray format
- Precise irrigation schemes
- Integrated environmental sensors
- Modular customized solutions
- Comprehensive software package

PlantScreen™
Modular Systems

The PlantScreen™ Modular System

is an integrated robotic solution designed for use in a greenhouse or a controlled environment. Larger plants in pots, such as maize and wheat, may be studied throughout their entire life cycle, but the system is also adaptable for the cultivation and study of smaller plants grown in multiple pots in trays.

Transport disks, or trays, are used on a conveyor system to move plants from the cultivation area to a series of imaging stations, through an adaptation tunnel, and to stations for watering, weighing and fertigation. The imaging stations provide digital analyses of plant growth dynamics and physiological performance. Multi-sensor digital data are acquired typically from top and side views.

Key features

- Plant-to-sensor concept
- Universal solutions for small to large plants up to 300 cm
- Modular design allows to screen single or multiple plants per tray
- Configurable multiple imaging sensors
- Turntables for 360° view imaging
- Precise irrigation and nutrient delivery schemes
- Integrated environmental sensors
- Comprehensive software package
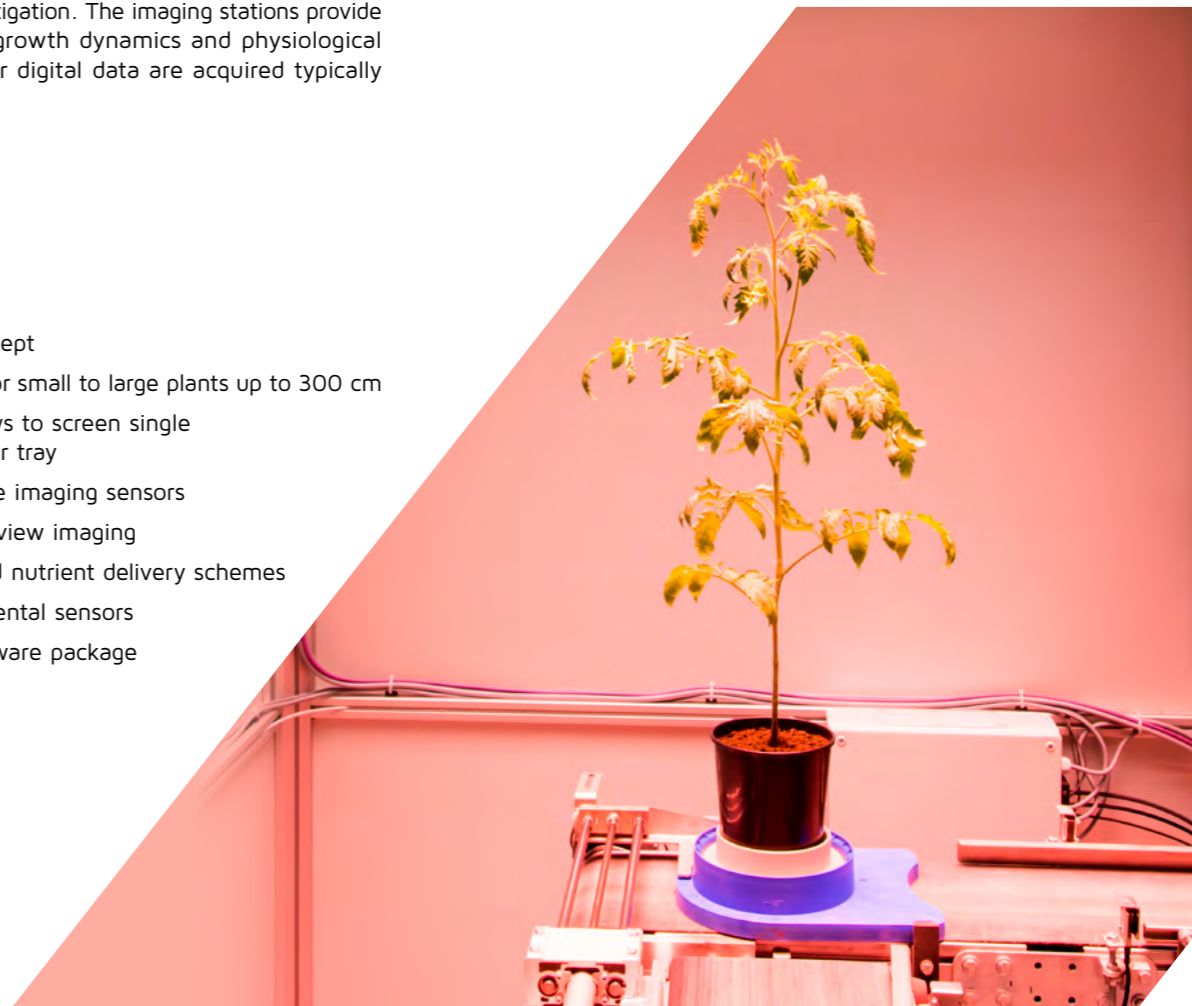
PlantScreen™
Robotic XYZ
& Transect XZ Systems

PlantScreen™
Field Systems
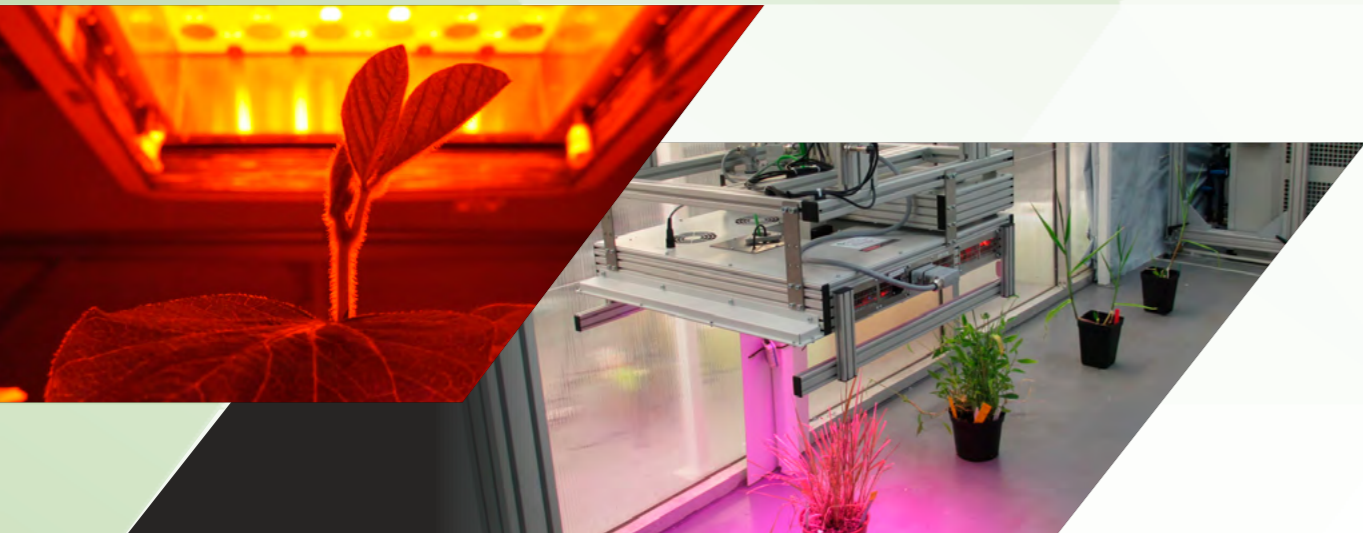
PlantScreen™ Robotic XYZ and Transect XZ Systems

are designed for automated sensor-to-plant phenotyping on the single and multiple plant level. A robotic arm is built above the growth space for movement of imaging sensors across a given area.

The system moves laterally (X and Y directions), and vertically (Z direction). The XZ/XYZ arm carries the imaging array, with its light sources, directly to the plants in a pattern defined in software and optimised for phenotyping efficiency.

XYZ phenotyping systems are available in a range of sizes from small scale cabinet models to extremely large-scale systems for incorporation into greenhouses or growth rooms. All systems include sensors for environmental monitoring.

Key features

- Sensor-to-plant concept
- Robust and stable construction with a movable camera and light sources in XYZ/XZ axis
- For various environments from lab to field
- Multiple imaging sensors
- Integrated environmental sensors
- Tailored solutions for in vitro or soil cultivations

PlantScreen™ Field Systems

are autonomous mobile platforms for fast and accurate crop phenotyping in the field. Each system incorporates a multi-functional sensor platform mounted on an autonomous drive mechanism and allows the user to monitor numerous aspects of plant growth, development and response to biotic and abiotic stresses in the plants' natural environment.

The PlantScreenTM Rover

is a smaller-scale mobile unit for fast and accurate crop phenotyping in the field or greenhouse. The system has drive mechanisms and integrates multiple sensors for non-invasive analysis of plant physiological and morphological features.

The Rover FluorCam is a customized fluorescence imaging system for physiological screening. Its wheels provide exceptional stability and easy movement among plants in the field. Large plants, such as corn, soybean etc. may be studied in situ without physical disturbance.

Key features

- Robust autonomous system
- Multi-functional sensor platform
- Environmental monitoring
- Robust mobile design
- Open database structure
- Integrated environmental sensors
- Sensor-to-plant concept

Research Center

Previous and current scientific projects

The mission of the PSI Plant Phenotyping Research Center is to provide state-of-art infrastructure for plant cultivation and automated high-throughput phenotyping of a wide range of phenotypic plant traits among various plant species under precisely controlled environmental conditions.

We offer access to cutting-edge instruments and provide professional support by highly-skilled technical and scientific personnel.

All the facilities of the PSI Plant Phenotyping Research Center are available for use by visiting scientists and on a fee-for-service basis for a wide range of phenotyping and plant cultivation experiments.

Realize your ideas

- Perform your own research supported by the PSI scientific team

- Choose a complete phenotyping service performed by the PSI researchers

- Skill development for students - diploma and Ph.D. positions are open

Experience our research facilities

- Automated Plant Phenotyping Systems

- High-End LED based plant

- Modern laboratory (molecular biology, analytics, microbiology)

- Newest PSI instrumentation and technology growth facilities